PROVINCIAL GOVERNMENT ACTIVITIES IN THE NATURAL SCIENCES

Province of Alberta

QUESTIONNAIRE AND GUIDE

FISCAL YEAR 1984-85

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Ministry/Department or Agency		Reporting Unit
Coordinator	Mailing Address	Telephone No.
Enquiries to be directed to	Telephone No.	Date

5-4600-122.1: 18-1-85 TB/CT - REG. B101536

INTRODUCTION

This questionnaire covers natural science activities funded by the provincial government. It includes expenditure and personnel data for research and development (R&D) and related scientific activities. All departments and agencies known to be conducting or funding activities in the natural sciences are included.

The classifications used in this questionnaire will not necessarily correspond to existing accounting systems or organizational units. Accurate data, therefore, depend on the good will and intelligent judgement of the responding officers. Information is required which describes the characteristics and magnitude of the department's activities; it is not a matter of decimal precision of data.

The data collected provide useful information for the development and analysis of provincial science policy. These statistics are also included with data collected from other sectors to provide national aggregates published by Statistics Canada. Data are released only with the approval of the provincial government.

This questionnaire includes only scientific activities in the natural sciences and technology.

Natural sciences and technology include the following disciplines:

Life sciences	- medical and biological
Physical sciences	- chemistry, physics and astronomy
Environmental sciences	- geology, oceanography and the study of the atmosphere
Engineering sciences	- architecture, civil engineering, etc.
Mathematical sciences	

If departmental scientific activities involve natural science disciplines, complete this questionnaire.

The social sciences and humanities include such disciplines as:

Anthropology	Law
Business administration and commerce	Library science
Communications	Philosophy
Criminology	Political science
Demography	Psychology
Economics	Religious studies
Geography	Social work
History	Sociology
Languages, literature and linguistics	Urban and regional studies

If departmental scientific activities involve these disciplines, complete the separate questionnaire on activities in the social sciences and humanities.

In many instances, particularly in health fields, it will be difficult to distinguish between the natural and the social sciences. In such instances, however, some allocation must be made. Respondents should consider the main orientation of the projects involved and the field of training of the personnel in determining this allocation. Any measure which reflects the actual situation is acceptable.

Scientific Activities

The activities which concern us are those scientific and technological (S&T) activities which involve the generation, dissemination and initial application of new scientific and technological knowledge. The central activity is research and experimental development (R&D). In addition, there are a number of activities closely related to R&D. Included in this survey are: education support, technical surveys, information services, special services and studies, and museum services.

Research and Experimental Development

Research and experimental development (R&D) is defined as creative work undertaken on a systematic basis to increase the stock of scientific and technical knowledge and to use this knowledge in new applications.

The central characteristic of R&D is an appreciable element of novelty and of uncertainty. *New* knowledge, products or processes are sought. The work is normally performed by, or under the supervision of, persons with post graduate degrees in the natural sciences or engineering.

R&D is generally carried out by specialized R&D units. However, an R&D project may also involve the use of non-R&D facilities (e.g. testing grounds), the purchase or construction of specialized equipment and materials, and the assistance of other units. Costs of such items, attributable to the project, are to be considered R&D costs.

R&D units may also be engaged in non-R&D activities such as technical advisory services, testing, and construction of special equipment for other units. So far as it is practical, the effort devoted to such operations should be excluded from R&D.

On the other hand, R&D may be carried out by units normally engaged in other functions (e.g. a marine survey ship used for hydrological research, a geological survey team directed to work in a certain area in order to provide data for a geophysical research project). Such effort is part of an R&D project and, again so far as is practical, the costs should be assigned to R&D expenditures.

Examples:

1. The development of new methods of identifying tree species and checking their condition is R&D; the use of recently developed methods, such as remote sensing and infra-red photography, as part of normal forestry surveys, is not.

2. The operation of a new transportation system as a demonstration project is not R&D; however the *creation* of the system as a *prototype* and the evaluation of its operations should be considered R&D.

3. Grants to provide equipment for an R&D laboratory are to be considered R&D; grants to provide the same equipment primarily for teaching or medical care should not be considered R&D.

Related Scientific Activities

Education support – grants to individuals or institutions which are intended to support the post secondary education of students in technology and the natural sciences. General operating or capital grants are excluded. Grants intended primarily to support the research of individuals at universities are either R&D grants or research fellowships.

Technical surveys – activities directed towards the exploration and systematic description of the earth and its natural resources.

The activities which make up technical surveys include the gathering, processing, collating and analyzing of data on natural phenomena except when part of a research project or a museum service. The preparation of maps and survey reports, their printing and cataloguing, are also included.

Typical technical surveys are regular geological, hydrographic, and topographic surveys, routine astronomic observations, establishment and maintenance of meteorological records; soil, plant, fisheries, and wildlife surveys, routine soil and water tests; and monitoring of radioactivity levels.

Information services – all work directed to recording, classifying, translating, and disseminating scientific and technological information. Included are the operations of scientific and technical libraries, the publication of scientific journals and bibliographies, and the organizing of scientific conferences. Grants for the publication of scholarly works are also included.

General purpose information services or information services directed primarily toward the general public are excluded, as are general departmental and public libraries. When individual budgets exist, the costs of libraries which belong to institutions otherwise entirely classified to another activity, such as R&D or Technical surveys, should be assigned to Information services. Information advisory and consultancy services for Industry and Agriculture are part of Information services. The costs of printing and distributing reports from activities such as Technical surveys or R&D are attributable to those activities.

Special services and studies – work directed towards the establishment of national and provincial standards for materials, devices, products and processes; the calibration of secondary standards; non-routine quality testing; feasibility studies and demonstration projects.

Feasibility studies are technical investigations of proposed engineering projects to provide additional information required to reach decisions on implementation. Demonstration projects involve the operation of scaled up versions of a facility or process, or prototypes, after the R&D is completed, to provide additional data on factors such as costs, operational characteristics, market demand and public acceptance. Projects called "demonstration projects" but which conform to the definition of R&D should be considered R&D. Once a facility or process is operated primarily to provide a service or to gain revenue, rather than as a demonstration, it should no longer be considered in Special services and studies. In all demonstration projects, only the net costs should be considered.

Museum services – comprise the collecting, cataloguing, and displaying of specimens of the natural world or of representations of natural phenomena. The scientific activities of natural history museums, zoological and botanical gardens, acquaria, planitaria, and nature reserves are included.

The activity represents a systematic attempt to preserve and display items from the natural world, in some ways it could be considered an extension of information services. Parks which are not primarily restricted reserves for certain fauna or flora are not included. In all cases the costs of providing entertainment and recreation to visitors should be excluded (e.g. restaurants, children's gardens, and nurseries).

If practical, resources of such institutions devoted to other activities, such as R&D or Information services, should be excluded from Museum services and assigned to those activities.

When a museum covers not only natural history but also aspects of human cultural activities, the museum's resources should be prorated between the natural and the social sciences. However, museums of science and technology, which display man-made objects and also may illustrate the operations of scientific "laws", should be considered in Museum services in the social sciences and humanities.

A. UNITS OF DEPARTMENT WHICH CARRIED OUT SCIENTIFIC ACTIVITIES (p.vii)

List those units (section/division/branch/station/group) of the department which carry out scientific activities and check the appropriate activities. If most of the units of a larger organization are engaged in the same activity, only the larger unit need be identified.

The list should help you to ensure that all the activities of the department are considered and that smaller units are not overlooked. It will also assist the data users to better understand the nature of the various scientific activities performed and could serve as a starting point for users requiring more information on some aspect of the the department's activities.

B. MAJOR PAYMENTS FOR SCIENTIFIC ACTIVITIES (p. viii)

Enter the name and city of each recipient of a major payment ($\geq$\$25,000) and enter the payment in the appropriate activity column. Both grants and contracts are included.

The information provided here will assist you to complete Question 1, the "key" question in the survey. It will also be used by Statistics Canada to ensure that major external performers of scientific activities are included in surveys of the other sectors.

Replies to this question will be treated as confidential by both Statistics Canada and the provincial government.

1. PERFORMERS OF SCIENTIFIC ACTIVITIES (p. 1 and 4)

Performers

Intramural - the reporting department. The scientific work is normally carried out by personnel assigned to the department and usually in facilities of the department. Also included are the administration of extramural programs, the costs of acquiring land, buildings and equipment to be used in scientific activities, and contracts to provide services required for scientific projects (e.g. rental of aircraft, computer services).

Industry - Canadian business and government enterprises. Include public utilities and government-owned firms as well as non-profit institutions and associations mainly serving industry and not controlled by another institution (e.g. Pulp & Paper Research Institute). Consultants providing scientific and engineering services are also included. Industrial research institutes affiliated with a university belong in the Universities sector.

Universities - Canadian universities and affiliated institutes owned, administered or staffed by them (e.g. Atlantic Industrial Research Institute of Nova Scotia Technical College). Teaching facilities in non-university hospitals are included.

Hospitals and health organizations - Canadian hospitals and health organizations which are not part of university medical schools.

Provincial research organizations - The Nova Scotia Research Council, the New Brunswick Research and Productivity Council, le Centre de recherche industrielle du Québec, the Ontario Research Foundation, the Manitoba Research Council, the Saskatchewan Research Council, the Alberta Research Council, and the Research Council of British Columbia.

Other - the federal government, other provincial government departments, municipal governments, individuals and institutions not identified with any other sector, and foreign performers.

Activities - the activities of R&D, education support, technical surveys, information services, special services and studies, and museum services have been defined above. These activities are further classified by type of expenditure.

Current expenditures - expenditures on items such as personnel, transportation and communications, information, professional and special services, rentals, purchased repair and upkeep, utilities, materials and supplies. Current expenditures for R&D are divided as follows:

In-house R&D - R&D performed by personnel of the reporting department. It may include R&D carried out on behalf of another department and covered by a transfer of funds, as well as services provided by other organizations (e.g. computing, transportation).

R&D contracts – payments to other organizations to carry out R&D intended to directly benefit the reporting department. The administration of R&D contracts is an intramural cost.

R&D grants and contributions – payments to other organizations (or individuals) for R&D intended basically to benefit the recipient of the grant. Contributions and loans should be considered as grants. The administration of R&D grants and contributions is an intramural cost.

Research fellowships – payments to individuals for advanced research training and experience. The aim of the program should be research training rather than education.

Capital expenditures – expenditures on the construction and acquisition of land, buildings, machinery, and equipment.

2. SOURCES OF FUNDS FOR SCIENTIFIC ACTIVITIES (p. 1)

This question identifies the sources of funds for the total expenditures on scientific activities reported in Question 1. It will help to ensure that work funded from outside the department is not overlooked.

From departmental budget - that portion of the total departmental budget which was spent on natural science activities.

From other departments – money transferred from another provincial department to this one for activities in the natural sciences. Include when applicable, provincial portions of any federal-provincial cost sharing programs and identify the program.

From the Federal government – all funds from the federal government used for natural science activities. The funds are referred to as payments, contributions, transfers, etc. Also include federal portions of any federal-provincial cost sharing programs and identify the program.

From trust funds – all funds from trust funds used for natural science activities.

From other sources – all funds for natural science activities from sources not specified above such as reserve funds, revenues from sales or fees.

3. DEPARTMENTAL PERSONNEL ENGAGED IN SCIENTIFIC ACTIVITIES (p. 2 and 4)

The categories used to classify personnel will generally correspond to those used by the provincial government. The definitions given below indicate the training and educational level generally required for such categories. In all cases, however, consider the job classification, not the person's qualifications, because there will be some employees who exceed the qualifications required by the job (e.g. a person with a degree in a technical or clerical position).

Scientific and professional – people in jobs that require at least one academic degree or nationally recognized professional qualification (e.g. chartered accountant - C.A.) as well as those with equivalent experience.

Technical – people in jobs that require specialized vocational or technical training beyond the secondary level (e.g. community colleges and technical institutes) as well as those with experience equivalent to this training.

Other – clerical, secretarial, administrative, operational and other support personnel.

Data are requested by activity and category of employment in person-years or full-time equivalent. Persons engaged only in a scientific activity are considered one person-year. Those working part-time only on scientific activities are considered as a fraction corresponding to their involvement. Include both permanent and non-permanent employees.

4. OBJECTIVES OF EXPENDITURES ON SCIENTIFIC ACTIVITIES (p. 3 and 5)

The objectives listed are not mutually exclusive, nor do they represent the total range of possible objectives. They are, however, intended to cover the major areas of current economic, political and technological interest. This list is common to both the social and natural sciences.

Report expenditures under the objective which is primary to that expenditure. Generally, the objective selected should be consistent with the stated objectives of the reporting department.

Advancement of science – activities for the development of general scientific knowledge (e.g. general R&D grants to universities or support of fields such as astronomy and archaeology).

Communications – activities in support of the development and regulation of communication services, including telecommunications.

Energy and fuels:

Conservation – activities directed towards the conservation of energy (e.g. domestic and commercial buildings, vehicles and other transportation systems, industrial processes, etc.).

Fossil fuels – activities concerned with the exploration, extraction, refining and use of crude oils, natural gas and coal.

Hydro electric energy – activities directed towards the generation and use of hydro electric power.

Renewable resources – activities directed towards the exploration or use of solar, biomass, hydraulic, geothermal or peat energy.

Other (specify) – any other activities not covered by those listed above.

Environmental issues – activities aimed at preserving or restoring environmental quality, including scientific work on pollution but excluding medical aspects. For example, R&D on diseases caused by pollution should be reported under the health objective. Those activities dealing with air, land and water should be reported separately.

Health – activities related to the maintenance and improvement of the physical well-being of the population.

Industrial and economic development:

Agriculture – activities which support the agricultural industry.

Fisheries – activities which support the fishing industry.

Forestry – activities which support the forestry industry.

Manufacturing – measures intended to achieve efficient and sustained growth in manufacturing industries, and the encouragement of the production of new goods and services.

Minerals – activities related to the location, extraction, processing, use and conservation of mineral resources (except fuels).

Other (specify) – any objectives not covered by those listed above.

Social development:

Culture, sport and recreation – activities related to the support and development of culture, physical fitness, sport and recreation. Include wilderness recreation and conservation of fauna and flora.

Education – education support, grants for education research, activities in support of education policy.

Human resources – activities directed towards the development and utilization of the labour force. Labour relations, personnel policy and training programs, demographic and immigration studies are included.

Urban and regional studies – studies directed towards understanding communities and improving life within the urban and rural community.

Other (specify) - other activities directed towards social well-being (e.g. administration of justice consumer protection).

Transportation - activities in support of the development and regulation of transportation services.

Other (specify) - any objectives not covered by those listed above.

Province Alberta

Ministry/Department _____

A. UNITS OF DEPARTMENT WHICH CARRIED OUT SCIENTIFIC ACTIVITIES, 1984-85 (Instructions - Page iii)

Unit	R&D	Education support	Technical surveys	Information services	Special services and studies	Museum services
				(√)		

DESCRIPTION OF INTRAMURAL ACTIVITIES

Briefly describe the intramural scientific activities of the reporting department. Describe major current projects rather than overall programs. Attach any relevant material (papers, annual reports, etc.) which provide descriptions of departmental activities.

Province Alberta

Ministry/Department _____

B. MAJOR PAYMENTS FOR SCIENTIFIC ACTIVITIES, 1984-85 (Instructions – Page iii)

Recipient	R&D	Education support	Technical surveys	Information services	Special services and studies	Museum services
	$000					

DESCRIPTION OF EXTRAMURAL ACTIVITIES

Briefly describe extramural projects, or programs, and identify the sectors in which they are conducted. If descriptive material or lists of projects are available they may be submitted in lieu of completing this question.

Province Alberta

Ministry/Department

1. PERFORMERS OF SCIENTIFIC ACTIVITIES, 1984-85 (Instructions – Page iii)

Scientific activity	Intramural activities	Payments to: Industry	Universities	Hospitals & health organizations	Provincial research organizations	Other	Total 1984-85
	$000						
Research and experimental development (R&D):							
Current expenditures:							
1. In-house R&D							
2. R&D contracts							
3. R&D grants and contributions							
4. Research fellowships							
5. Sub-total (1 + 2 + 3 + 4)							
6. Capital expenditures							
Related scientific activities (RSA):							
Current expenditures:							
7. Education support							
8. Technical surveys							
9. Information services							
10. Special services and studies							
11. Museum services							
12. Capital expenditures							
13. TOTAL EXPENDITURES							

2. SOURCES OF FUNDS FOR SCIENTIFIC ACTIVITIES, 1984-85 (Instructions – Page iv)

	$000
. From departmental budget	
. From other departments	
. From federal government (specify source)	
. From trust funds	
. From other sources (reserve funds, revenues from sales or fees)	
. TOTAL EXPENDITURES	

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3. DEPARTMENTAL PERSONNEL ENGAGED IN SCIENTIFIC ACTIVITIES, 1984-85
(Instructions – Page iv)

Type of personnel	R&D	Related scientific activities	Total 1984-85
	Person-years		
1. Scientific and professional			
2. Technical			
3. Other			
4. TOTAL PERSONNEL			

Province Alberta

Ministry/Department

4. OBJECTIVES OF EXPENDITURES ON SCIENTIFIC ACTIVITIES, 1984-85 (Instructions - Page v)

Objective	Intramural		Extramural		Total 1984-85
	R&D	Related scientific activities	R&D	Related scientific activities	
	$000				
1. Advancement of Science					
2. Communications					
Energy & fuels:					
3. Conservation					
4. Fossil fuels					
5. Hydro electric energy					
6. Renewable resources					
7. Other (specify)					
Environmental issues:					
8. Air					
9. Land					
10. Water					
11. Other (specify)					
12. Health					
Industrial & economic development:					
13. Agriculture					
14. Fisheries					
15. Forestry					
16. Manufacturing					
17. Minerals					
18. Other (specify)					
Social development:					
19. Culture, sport & recreation					
20. Education					
21. Human resources					
22. Urban & regional studies					
23. Other (specify)					
24. Transportation					
25. Other (specify)					
26. TOTAL	1	2	3	4	

[1] Equal to Question 1: column 1, rows 5 and 6
[2] Equal to Question 1: column 1, rows 7, 8, 9, 10, 11 and 12
[3] Equal to Question 1: columns 2, 3, 4, 5 and 6, row 5
[4] Equal to Question 1: columns 2, 3, 4, 5 and 6, rows 7, 8, 9, 10 and 11

Province Alberta

Ministry/Department

5. PERFORMERS OF SCIENTIFIC ACTIVITIES, 1985-86 ESTIMATES (Instructions – Page iii)

Scientific activity	Intramural activities	Payments to: Industry	Universities	Hospitals & health organizations	Provincial research organizations	Other	Total 1985-86
	$000						
Research and experimental development (R&D):							
Current expenditures:							
1. In-house R&D							
2. R&D contracts							
3. R&D grants and contributions							
4. Research fellowships							
5. **Sub-total** (1 + 2 + 3 + 4)							
6. Capital expenditures							
Related scientific activities (RSA):							
Current expenditures:							
7. Education support							
8. Technical surveys							
9. Information services							
10. Special services and studies							
11. Museum services							
12. Capital expenditures							
13. **TOTAL EXPENDITURES**							

6. DEPARTMENTAL PERSONNEL ENGAGED IN SCIENTIFIC ACTIVITIES, 1985-86 ESTIMATES (Instructions – Page iv)

Type of personnel	R&D	Related scientific activities	Total 1985-86
	Person-years		
1. Scientific and professional			
2. Technical			
3. Other			
4. **TOTAL PERSONNEL**			

Province Alberta

Ministry/Department

7. OBJECTIVES OF EXPENDITURES ON SCIENTIFIC ACTIVITIES, 1985-86 ESTIMATES (Instructions – Page v)

Objective	Intramural		Extramural		Total 1985-86
	R&D	Related scientific activities	R&D	Related scientific activities	
	$000				
1. Advancement of Science					
2. Communications					
Energy & fuels:					
3. Conservation					
4. Fossil fuels					
5. Hydro electric energy					
6. Renewable resources					
7. Other (specify) _____					
Environmental issues:					
8. Air					
9. Land					
10. Water					
11. Other (specify) _____					
12. Health					
Industrial & economic development:					
13. Agriculture					
14. Fisheries					
15. Forestry					
16. Manufacturing					
17. Minerals					
18. Other (specify) _____					
Social development:					
19. Culture, sport & recreation					
20. Education					
21. Human resources					
22. Urban & regional studies					
23. Other (specify) _____					
24. Transportation					
25. Other (specify) _____					
26. TOTAL	[1]	[2]	[3]	[4]	

[1] Equal to Question 5: column 1, rows 5 and 6
[2] Equal to Question 5: column 1, rows 7, 8, 9, 10, 11 and 12
[3] Equal to Question 5: columns 2, 3, 4, 5 and 6, row 5
[4] Equal to Question 5: columns 2, 3, 4, 5 and 6, rows 7, 8, 9, 10 and 11

PROVINCIAL GOVERNMENT ACTIVITIES
IN THE
SOCIAL SCIENCES AND HUMANITIES

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This questionnaire includes only scientific activities in the social sciences and humanities.

The social sciences and humanities include such disciplines as:

Anthropology
Business administration and commerce
Communications
Criminology
Demography
Economics
Geography
History
Languages, literature and linguistics
Law
Library science
Philosophy
Political science
Psychology
Religious studies
Social work
Sociology
Urban and regional studies

If departmental scientific activities involve these disciplines, complete this questionnaire.

Natural sciences and technology include the following disciplines:

Life sciences
Physical sciences
Environmental sciences
Engineering sciences
Mathematical sciences

- medical and biological
- chemistry, physics and astronomy
- geology, oceanography and the study of the atmosphere
- architecture, civil engineering, etc.

If departmental scientific activities involve these disciplines, complete the separate questionnaire on the natural sciences and technology.

In many instances, particularly in health fields, it will be difficult to distinguish between the social and natural sciences. In such instances, however, some allocation must be made. Respondents should consider the main orientation of the projects involved and the field of training of the personnel in determining this allocation. Any measure which reflects the actual situation is acceptable.

Scientific Activities

The activities which concern us are those scientific and technological (S&T) activities which involve the generation, dissemination and initial application of new scientific and technological knowledge. The central activity is research and experimental development (R&D). In addition, there are a number of activities closely related to R&D. Included in this survey are: education support, statistical surveys, information services, special services and studies, and museum services.

Research and Experimental Development

Research and experimental development (R&D) is defined as creative work undertaken on a systematic basis towards the acquisition of new knowledge about man, his actions and his institutions, and the application of this knowledge in new ways.

Both "research" and "development" are often used with different meanings in the government. For example, it is increasingly common to hear that someone is researching something, i.e., the person is looking for information about something.

Similarly, there are many units with either research or development or both terms in their titles which are concerned primarily with information gathering, speech writing, preparation of position papers or departmental organization.

R&D requires the acquisition of knowledge and not just information. New knowledge involves the integration of newly acquired information into existing hypotheses, the formulation and testing of new hypotheses or the reevaluation of existing observations.

An R&D project generally has three characteristics:

- a substantial element of uncertainty, novelty and innovation;
- a well-defined project design;
- a report on the procedures and results of the project.

"Many social scientists perform work in which they bring the established methodologies and facts of the social sciences to bear upon a particular problem, but which cannot be classified as research. The following are examples of work which might come in this category and are *not* R&D: interpretative commentary on the probable economic effects of a change in the tax structure, using existing economic data; forecasting future changes in the pattern of the demand for social services within a given area arising from an altered demographic structure; operations research as a contribution to decision-making, e.g. planning the optimal distribution system for a factory; the use of standard techniques in applied psychology to select and classify industrial and military personnel, students, etc., and to test children with reading or other disabilities."
(Frascati Manual)

Related Scientific Activities

Education support – grants to individuals or institutions which are intended to support the post secondary education of students in the social sciences and humanities. General operating or capital grants are excluded. Grants intended primarily to support the research of individuals at universities are either R&D grants or research fellowships.

Statistical surveys – the collecting, processing and disseminating of statistics on man, his economic and social activities. Included are the development of technical methodology and statistical analysis.

The institutions involved are the statistical bureaux of provincial governments and the statistical sections of departments and agencies. If there are units whose principal activity is R&D, their costs and personnel should be assigned to R&D; specialized libraries with separate budgets should be assigned to Information services.

Information services – all work directed to recording, classifying, translating, and disseminating information resulting from R&D in the social sciences or required in support of such R&D. Included are the operations of specialized libraries and archives, the publication of scholarly journals and bibliographies, and the organizing of scientific conferences. Grants for the publication of scholarly works are also included.

General purpose information services or information services directed primarily toward the general public are excluded, as are general departmental and public libraries. When individual budgets exist, the costs of libraries which belong to institutions otherwise entirely classified to another activity, such as R&D or Statistical surveys, would be assigned to Information services. The costs of printing and distributing reports from activities such as Statistical surveys or R&D are attributable to those activities.

Special services and studies – systematic investigations carried out in order to provide information needed for planning or policy formulation. Demonstration projects are also included.

The work is usually carried out by specialized units in some government departments, by consultants, by royal commissions, and by task forces. The activity is similar to R&D since it may require innovative analyses and a high degree of scientific ability. However, such studies are not intended to acquire new knowledge but to provide specific answers to specific problems (generally immediate, localized and perhaps temporary). The day-to-day operations of units concerned with departmental planning, organization or management are not normally included but special projects may be relevant.

Examples of special studies would be a study of the viability of a petrochemical complex in a certain region of Canada, the Royal Commission on Poverty, the MacKenzie Valley Pipeline Inquiry, the Science Council's special studies, and the Manitoba Guaranteed Income Experiment (net costs).

Museum services – the collecting, cataloguing, and displaying of specimens and representations relating to the history, social organization, and creations of man.

The activity represents a systematic attempt to preserve and display the works of man and to provide information on his works, history, and nature. The scientific activities of historical museums, archaeological displays, and art galleries are included. In all cases, the costs of providing entertainment and recreation to visitors should be excluded (e.g. restaurants, children's gardens, and nurseries).

If practical, resources of such institutions devoted to other activities, such as R&D or Information services, should be excluded from Museum services and assigned to those activities.

When a museum also covers aspects of natural history, the museum's operations should be divided between the social and natural sciences. However, museums of science and technology, war, etc., which display man-made objects and may also illustrate the operations of certain technologies, should be considered as Museum services in the social sciences and humanities.

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1. PERFORMERS OF SCIENTIFIC ACTIVITIES (p. 1 and 4)

Performers

Intramural - the reporting department. The scientific work is normally carried out by personnel assigned to the department and usually in facilities of the department. Also included are the administration of extramural programs, the costs of acquiring land, buildings and equipment to be used in scientific activities, and contracts to provide services required for scientific projects (e.g. rental of aircraft, computer services).

Industry - Canadian business and government enterprises. Include public utilities and government-owned firms as well as non-profit institutions and associations mainly serving industry and not controlled by another institution (e.g. Pulp & Paper Research Institute). Consultants providing scientific and engineering services are also included. Industrial research institutes affiliated with a university belong in the Universities sector.

Universities - Canadian universities and affiliated institutes owned, administered or staffed by them (e.g. Atlantic Industrial Research Institute of Nova Scotia Technical College). Teaching facilities in non-university hospitals are included.

Hospitals and health organizations - Canadian hospitals and health organizations which are not part of university medical schools.

Provincial research organizations - The Nova Scotia Research Council, the New Brunswick Research and Productivity Council, le Centre de recherche industrielle du Québec, the Ontario Research Foundation, the Manitoba Research Council, the Saskatchewan Research Council, the Alberta Research Council, and the Research Council of British Columbia.

Other - the federal government, other provincial government departments, municipal governments, individuals and institutions not identified with any other sector, and foreign performers.

Activities - The activities of R&D, education support, statistical surveys, information services, special services and studies, and museum services have been defined above. These activities are further classified by type of expenditure.

Current expenditures - expenditures on items such as personnel, transportation and communications, information, professional and special services, rentals, purchased repair and upkeep, utilities, materials and supplies. Current expenditures for R&D are divided as follows:

> **In-house R&D** - R&D performed by personnel of the reporting department. It may include R&D carried out on behalf of another department and covered by a transfer of funds, as well as services provided by other organizations (e.g. computing, transportation).

R&D contracts - payments to other organizations to carry out R&D intended to directly benefit the reporting department. The administration of R&D contracts is an intramural cost.

R&D grants and contributions - payments to other organizations (or individuals) for R&D intended basically to benefit the recipient of the grant. Contributions and loans should be considered as grants. The administration of R&D grants and contributions is an intramural cost.

Research fellowships - payments to individuals for advanced research training and experience. The aim of the program should be research training rather than education.

Capital expenditures - expenditures on the construction and acquisition of land, buildings, machinery, and equipment.

2. SOURCES OF FUNDS FOR SCIENTIFIC ACTIVITIES (p. 1)

This question identifies the sources of funds for the total expenditures on scientific activities reported in Question 1. It will help to ensure that work funded from outside the department is not overlooked.

From departmental budget - that portion of the total departmental budget which was spent on social science activities.

From other departments - money transferred from another provincial department to this one for activities in the social sciences. Include when applicable, provincial portions of any federal-provincial cost sharing programs and identify the program.

From the Federal government - all funds from the federal government used for social science activities. The funds are referred to as payments, contributions, transfers, etc. Also include federal portions of any federal-provincial cost sharing programs and identify the program.

From trust funds - all funds from trust funds used for social science activities.

From other sources - all funds for social science activities from sources not specified above such as reserve funds, revenues from sales or fees.

3. DEPARTMENTAL PERSONNEL ENGAGED IN SCIENTIFIC ACTIVITIES (p. 2 and 4)

The categories used to classify personnel will generally correspond to those used by the provincial government. The definitions given below indicate the training and educational level generally required for such categories. In all cases, however, consider the job classification, not the person's qualifications, because there will be some employees who exceed the qualifications required by the job (e.g. a person with a degree in a technical or clerical position).

Scientific and professional - people in jobs that require at least one academic degree or nationally recognized professional qualification (e.g. chartered accountant - C.A.) as well as those with equivalent experience.

Technical - people in jobs that require specialized vocational or technical training beyond the secondary level (e.g. community colleges and technical institutes) as well as those with experience equivalent to this training.

Other - clerical, secretarial, administrative, operational and other support personnel.

Data are requested by activity and category of employment in person-years or full-time equivalent. Persons engaged only in a scientific activity are considered one person-year. Those working only part-time on scientific activities are considered as a fraction corresponding to their involvement. Include both permanent and non-permanent employees.

4. OBJECTIVES OF EXPENDITURES ON SCIENTIFIC ACTIVITIES (p. 3 and 5)

The objectives listed are not mutually exclusive, nor do they represent the total range of possible objectives. They are, however, intended to cover the major areas of current economic, political and technological interest. This list is common to both the social and natural sciences.

Report expenditures under the objective which is primary to that expenditure. Generally, the objective selected should be consistent with the stated objectives of the reporting department.

Advancement of science – activities for the development of general scientific knowledge (e.g. general R&D grants to universities or support of fields such as astronomy and archaeology).

Communications – activities in support of the development and regulation of communication services, including telecommunications.

Energy and fuels:

Conservation – activities directed towards the conservation of energy (e.g. domestic and commercial buildings, vehicles and other transportation systems, industrial processes, etc.).

Fossil fuels – activities concerned with the exploration, extraction, refining and use of crude oils, natural gas and coal.

Hydro electric energy – activities directed towards the generation and use of hydro electric power.

Renewable resources – activities directed towards the exploration or use of solar, biomass, hydraulic, geothermal or peat energy.

Other (specify) – any other activities not covered by those listed above.

Environmental issues – activities aimed at preserving or restoring environmental quality, including scientific work on pollution but excluding medical aspects. For example, R&D on diseases caused by pollution should be reported under the health objective. Those activities dealing with air, land and water should be reported separately.

Health – activities related to the maintenance and improvement of the physical well-being of the population.

Industrial and economic development:

Agriculture – activities which support the agricultural industry.

Fisheries – activities which support the fishing industry.

Forestry – activities which support the forestry industry.

Manufacturing – measures intended to achieve efficient and sustained growth in manufacturing industries, and the encouragement of the production of new goods and services.

Minerals – activities related to the location, extraction, processing, use and conservation of mineral resources (except fuels).

Other (specify) – any objectives not covered by those listed above.

Social development:

Culture, sport and recreation – activities related to the support and development of culture, physical fitness, sport and recreation. Include wilderness recreation and conservation of fauna and flora.

Education – education support, grants for education research, activities in support of education policy.

Human resources – activities directed towards the development and utilization of the labour force. Labour relations, personnel policy and training programs, demographic and immigration studies are included.

Urban and regional studies – studies directed towards understanding communities and improving life within the urban and rural community.

Other (specify) – other activities directed towards social well-being (e.g. administration of justice consumer protection).

Transportation – activities in support of the development and regulation of transportation services.

Other (specify) – any objectives not covered by those listed above.

Province Alberta

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A. UNITS OF DEPARTMENT WHICH CARRIED OUT SCIENTIFIC ACTIVITIES, 1984-85 (Instructions – Page iii)

Unit	Research and experimental development	Related scientific activities
		(✓)

DESCRIPTION OF INTRAMURAL ACTIVITIES

Briefly describe the intramural scientific activities of the reporting department. Describe major current projects rather than overall programs. Attach any relevant material (papers, annual reports, etc.) which provide description of departmental activities.

Province Alberta

Ministry/Department _____

B. MAJOR PAYMENTS FOR SCIENTIFIC ACTIVITIES, 1984-85 (Instructions - Page iii)

Recipient	Research and experimental development	Related scientific activities
	$000	

DESCRIPTION OF EXTRAMURAL ACTIVITIES

Briefly describe extramural projects, or programs, and identify the sectors in which they are conducted. If descriptive material or lists of projects are available they may be submitted in lieu of completing this question.

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Province Alberta

Ministry/Department _____

1. PERFORMERS OF SCIENTIFIC ACTIVITIES, 1984-85 (Instructions – Page iii)

Scientific activity	Intramural activities	Payments to: Industry	Universities	Hospitals & health organizations	Provincial research organizations	Other	Total 1984-85
	$000						
Research and experimental development (R&D):							
Current expenditures:							
1. In-house R&D							
2. R&D contracts							
3. R&D grants and contributions							
4. Research fellowships							
5. **Sub-total** (1 + 2 + 3 + 4)							
6. Capital expenditures							
Related scientific activities (RSA):							
7. Current expenditures							
8. Capital expenditures							
9. **TOTAL EXPENDITURES**							

2. SOURCES OF FUNDS FOR SCIENTIFIC ACTIVITIES, 1984-85 (Instructions – Page iv)

	$000
1. From departmental budget	
2. From other departments	
3. From federal government (specify source)	
4. From trust funds	
5. From other sources (reserve funds, revenues from sales or fees)	
6. **TOTAL EXPENDITURES**	

Province Alberta

Ministry/Department _____

3. DEPARTMENTAL PERSONNEL ENGAGED IN SCIENTIFIC ACTIVITIES, 1984-85 (Instructions – Page iv)

Type of personnel	R&D	Related scientific activities	Total 1984-85
	Person-years		
1. Scientific and professional			
2. Technical			
3. Other			
4. TOTAL PERSONNEL			

Province Alberta

Ministry/Department

4. OBJECTIVES OF EXPENDITURES ON SCIENTIFIC ACTIVITIES, 1984-85 (Instructions – Page iv)

Objective	Intramural		Extramural		Total 1984-85
	R&D	Related scientific activities	R&D	Related scientific activities	
	$000				
1. Advancement of Science					
2. Communications					
Energy & fuels:					
3. Conservation					
4. Fossil fuels					
5. Hydro electric energy					
6. Renewable resources					
7. Other (specify)					
Environmental issues:					
8. Air					
9. Land					
10. Water					
11. Other (specify)					
12. Health					
Industrial & economic development:					
13. Agriculture					
14. Fisheries					
15. Forestry					
16. Manufacturing					
17. Minerals					
18. Other (specify)					
Social development:					
19. Culture, sport & recreation					
20. Education					
21. Human resources					
22. Urban & regional studies					
23. Other (specify)					
24. Transportation					
25. Other (specify)					
26. TOTAL	[1]	[2]	[3]	[4]	

[1] Equal to Question 1: column 1, rows 5 and 6
[2] Equal to Question 1: column 1, rows 7 and 8
[3] Equal to Question 1: columns 2, 3, 4, 5 and 6, row 5
[4] Equal to Question 1: columns 2, 3, 4, 5 and 6, row 7

Province Alberta

Ministry/Department _____

5. PERFORMERS OF SCIENTIFIC ACTIVITIES, 1985-86 ESTIMATES (Instructions – Page iii)

Scientific activity	Intramural activities	Payments to: Industry	Universities	Hospitals & health organizations	Provincial research organizations	Other	Total 1985-86
	$000						
Research and experimental development (R&D):							
Current expenditures:							
1. In-house R&D							
2. R&D contracts							
3. R&D grants and contributions							
4. Research fellowships							
5. **Sub-total** (1 + 2 + 3 + 4)							
6. Capital expenditures							
Related scientific activities (RSA):							
7. Current expenditures							
8. Capital expenditures							
9. **TOTAL EXPENDITURES**							

6. DEPARTMENTAL PERSONNEL ENGAGED IN SCIENTIFIC ACTIVITIES, 1985-86 ESTIMATES (Instructions – Page iv)

Type of personnel	R&D	Related scientific activities	Total 1985-86
	Person-years		
1. Scientific and professional			
2. Technical			
3. Other			
4. **TOTAL PERSONNEL**			

Province Alberta

Ministry/Department _____

7. OBJECTIVES OF EXPENDITURES ON SCIENTIFIC ACTIVITIES, 1985-86 ESTIMATES (Instructions – Page iv)

Objective	Intramural		Extramural		Total 1985-86
	R&D	Related scientific activities	R&D	Related scientific activities	
	$000				
1. Advancement of Science					
2. Communications					
Energy & fuels:					
3. Conservation					
4. Fossil fuels					
5. Hydro electric energy					
6. Renewable resources					
7. Other (specify) _____					
Environmental issues:					
8. Air					
9. Land					
10. Water					
11. Other (specify) _____					
12. Health					
Industrial & economic development:					
13. Agriculture					
14. Fisheries					
15. Forestry					
16. Manufacturing					
17. Minerals					
18. Other (specify) _____					
Social development:					
19. Culture, sport & recreation					
20. Education					
21. Human resources					
22. Urban & regional studies					
23. Other (specify) _____					
24. Transportation					
25. Other (specify) _____					
26. TOTAL	[1]	[2]	[3]	[4]	

[1] Equal to Question 5: column 1, rows 5 and 6
[2] Equal to Question 5: column 1, rows 7 and 8
[3] Equal to Question 5: columns 2, 3, 4, 5 and 6, row 5
[4] Equal to Question 5: columns 2, 3, 4, 5 and 6, row 7

Appendix B - Methodology Used In Producing Estimates for the University Sector

1. Expenditure Estimates

Data on research expenditures in the public and private sectors used in this report were compiled through annual surveys. There is, however, no such survey of research expenditures by universities in Alberta. As a result, the procedure for estimating these figures developed by the Canadian Association of University Business Officers (CAUBO) has been adopted for this purpose. The methodology is documented in detail in the Report of the Study on the Costs of University Research, August, 1982.

Universities are typically engaged in two types of research activity:

> Sponsored Research is research activity for which financial support is derived from sources external to the university. This includes funds transferred from trusts and endowments for research purposes, contracts, or grants in aid of research, but does not include research sponsored directly by the university.
>
> Non-Sponsored Research is research activity which is initiated and funded solely from within the university.

The university contributes in various ways toward the support of both types of research. This is done through allocations made from its operating funds, derived primarily from governmental sources, tuition fees and donations. These allocations support not only all costs associated with non-sponsored research, but also such indirect costs associated with sponsored research as professional salaries and support services such as libraries, computers, administration, consumable supplies and physical plant.

Therefore, in terms used in this report, Alberta's universities, through their operating funds, support all costs associated with non-sponsored research, both direct and indirect, and the indirect costs of sponsored research. Other sectors (the Federal Government, industry and the Alberta Government, through

contracts and non-operating research grants) are the source of funds for all direct costs of sponsored research performed at Alberta's universities. The total dollar value of all research performed by Alberta's universities is, then, the sum of all the direct and indirect costs of both sponsored and non-sponsored research.

1.1 Derivation of Research Expenditures

Based on the CAUBO methodology, research expenditures are calculated from the total operating expenditures of each university. Total operating expenditures are all expenditures made by the university including those from the general operating fund, trust and endowment funds, and sponsored research allocations, but excluding those from the capital account.

These expenditures have been broken down by faculty with general costs of the university being distributed across each faculty according to its proportion of total faculty expenditure. Faculties are classified according to the Statistics Canada classification of education disciplines. These "discipline groups" are:

1) Education, including Physical Education
2) Humanities, Fine Arts and Social Sciences
3) Business, Administration and Law
4) Physical and Applied Sciences

Multipliers have been derived from the CAUBO study which express, for each discipline group, total research expenditures as a proportion of total operating expenditures. These proportions are reported in Table 1.

When these proportions are applied to values given for sponsored research, trusts and endowments and operating expenditures as reported in the annual financial statements for each university, the form of the relationship becomes:

$$TR = TE(M_1)$$

where:

TR = Total Research Expenditures.
TE = Total Operating Expenditures as reported, including sponsored research, and trusts and endowments.
M_1 = Proportion of TE attributable to research.

The formula is applied to each of the four discipline groups, and the figures are summed to obtain an estimate of total research expenditures by the institution.

2. Personnel Estimates

It is also necessary to estimate the amount of personnel time devoted to research and development. This calculation is based on Full-Time Equivalent data for both full-time and part-time academic staff in teaching faculties at Alberta's universities. It is assumed that the nature of the faculty determines to some extent the proportion of time available for research activity. For this reason the CAUBO methodology also forms the basis for estimates of person-years for research and development.

CAUBO recognizes faculty time can be apportioned to at least three activities: instruction, research, and community and professional service. CAUBO's "Empirical Faculty Activities Analysis" shows research time for all disciplines averages 26 percent. More recent discussion by CAUBO and others suggests that this multiplier may be unrealistically low. Until a better methodology can be devised, it is believed that the average of 36 percent for research time (as employed in previous reports), is a more suitable multiplier for estimating person-years devoted to research and development.

TABLE 1

MULTIPLIERS USED IN THE DERIVATION OF UNIVERSITY RESEARCH EXPENDITURES BY DISCIPLINE GROUP

Discipline Group	Total Research Expenditures as a Percentage of Total Operating Expenditures (M_1)
Education	17
Humanities and Social Sciences	33
Business Administration and Law	25
Physical and Applied Sciences	45
Total Combined	36